



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/625,952	07/23/2003	Ying Huang	MI22-2347	9905
21567	7590	09/29/2004	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			NGUYEN, JOSEPH H	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 09/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/625,952	Applicant(s) HUANG ET AL.	
	Examiner Joseph Nguyen	Art Unit 2815	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 August 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 31-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 31-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>08/02/04</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION*****Election/Restrictions***

Applicant's election of claims 31-40 in the reply filed on 08/02/2004 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 31-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Chung.

Regarding claim 31, Chung discloses on figure 2F integrated circuitry comprising a substrate (Para [0090]); a plurality of spaced conductive layers (metal) over the substrate and comprising upper surfaces; a low K material (organic low-k dielectric) disposed over the substrate and between the conductive layers, an entirety of the low K material being elevationally below the upper surfaces of the conductive layers; and a dielectric material (inorganic

Art Unit: 2815

dielectric) having a first portion disposed over the low K material elevationally below and between the upper surfaces of the conductive layers and a second portion disposed over the upper surfaces of the conductive layers.

Regarding claim 32, Chung discloses on figure 2F the low K material comprises a first low K material and wherein the dielectric material comprises a second low K material different from the first low K material.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 31, 35-37, 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al (US 5,946,601) in view of Cohen et al.

Regarding claim 31, Wong discloses on figure 1i substantially all the structures set forth in the claimed invention except a low K material disposed over the substrate and between the conductive layers, an entirety of the low K material being elevationally below the upper surfaces of the conductive layers; and a dielectric material having a first portion disposed over the low K material elevationally below and between the upper surfaces of the conductive layers and a second portion disposed over the upper surfaces of the conductive layers. However, Cohen et al discloses on figure 4 a low K material 16 disposed over the

Art Unit: 2815

substrate and between the conductive layers 2, an entirety of the low K material being elevationally below the upper surfaces of the conductive layers; and a dielectric material 20 having a first portion disposed over the low K material elevationally below and between the upper surfaces of the conductive layers and a second portion disposed over the upper surfaces of the conductive layers. IN view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Wong et al by having a low K material disposed over the substrate and between the conductive layers, an entirety of the low K material being elevationally below the upper surfaces of the conductive layers; and a dielectric material having a first portion disposed over the low K material elevationally below and between the upper surfaces of the conductive layers and a second portion disposed over the upper surfaces of the conductive layers for the purpose of improving the electrical interconnect within a semiconductor device.

Regarding claim 35, Wong et al discloses on figure 1i the low K material 110 comprises a first low K material and wherein the dielectric material 150 comprises a second low K material having the same composition as the first low K material.

Regarding claim 36, Wong et al discloses on figure 1i a barrier layer 140 disposed between the low K material 110 and the dielectric material 150.

Regarding claim 37, Wong et al discloses on figure 1i two barrier layers 120, 140 disposed between the low K material 110 and the dielectric material 150.

Art Unit: 2815

Regarding claim 39, Wong et al discloses on figure 1i a barrier layer 140 disposed between the upper surfaces of the spaced conductive layers 131, 132 and the dielectric material 150.

Regarding claim 40, Wong et al discloses on figure 1i a barrier layer 140 having a first portion disposed between the upper surfaces of the spaced conductive layers 131, 132 and the dielectric material 150 and a second portion disposed between the low K material 110 and the dielectric material 150.

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al and Cohen et al as applied to claim 31 above, and further in view of Lin.

Regarding claim 33, Wong et al and Cohen et al disclose substantially all the structures set forth in the claimed invention except the dielectric material comprising a hydrogen silsequioxane material. However, Lin discloses the dielectric material comprising a hydrogen silsequioxane material (col. 1, lines 34-40). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Wong et al and Cohen et al by having the dielectric material comprising a hydrogen silsequioxane material for the purpose of reducing parasitic capacitance as taught by Lin (col. 1, lines 37-39).

Art Unit: 2815

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al and Cohen et al as applied to claim 31 above, and further in view of Matsuno.

Regarding claim 34, Wong et al and Cohen et al disclose substantially all the structures set forth in the claimed invention except the low K material comprising a carbon comprising silicon oxide material. However, Matsuno discloses on figure 5 the low K material 2 comprising a carbon comprising silicon oxide material (col. 4, lines 36-43). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Wong et al and Cohen et al by having the low K material comprising a carbon comprising silicon oxide material for the purpose of reducing current leakage between wiring layers as taught by Matsuno (col. 9, lines 44-45).

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al and Cohen et al as applied to claim 31 above, and further in view of Stamper.

Regarding claim 38, Wong et al and Cohen et al disclose substantially all the structures set forth in the claimed invention except at least two barrier layers disposed between the spaced conductive layers. However, Stamper discloses on figure 1A at least two barrier layers 15, 21 disposed between the spaced conductive layers 12. In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Wong et al and Cohen et al by having at least two barrier layers disposed between the

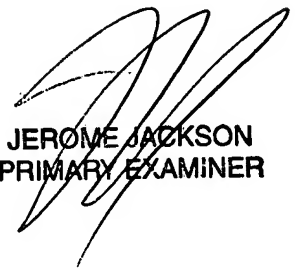
Art Unit: 2815

spaced conductive layers for the purpose of having good electromigration resistance properties as taught by Stamper (col. 5, lines 1-20).

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-1734. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for regular communications.

JN  
September 24, 2004.

  
JEROME JACKSON  
PRIMARY EXAMINER